ecowitt®

3-in-1 Soil Sensor
Moisture/Temperature/EC
Manual

Model: WH52

https://s.ecowitt.com/2W1W5B

Table of Contents

1.Ecowitt System Introduction

Thank you for purchasing the **WH52 Soil Moisture, Temperature, and EC Sensor.** This device measures soil moisture, temperature, and electrical conductivity (EC). Data is transmitted via an Ecowitt Wi-Fi Gateway (sold separately) or console (sold separately) and can be viewed on the WSView Plus or Ecowitt App after completing the configuration (Wi-Fi or LAN depending on console model). Alternatively, a receiver console with an inbuilt display for the WN2 (sold separately) can be used to display the received sensor values.

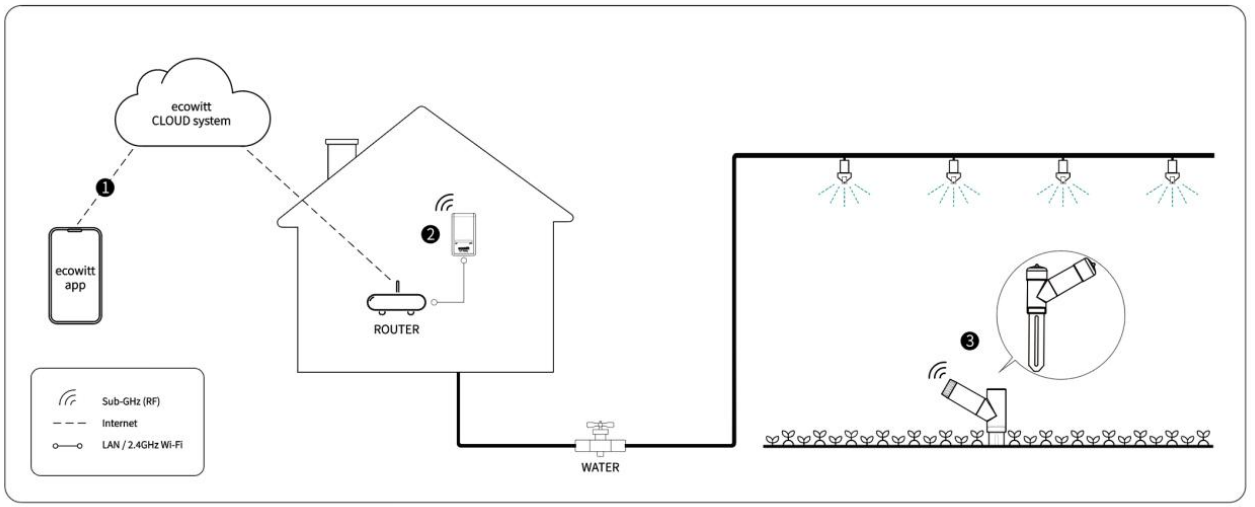


Figure 1 How Ecowitt System Work

① Unless you have already an account at ecowitt.net and a console/gateway registered, you first have to perform the Gateway/console Registration by the help of one of our Apps or directly at ecowitt.net – otherwise continue with (3)

if via the app:

Download the application (Ecowitt app or WS View Plus app), create an account, log into your

account, and select the option to add a new device.

② Gateway Network Connection: Power on the gateway/console to initiate the network pairing mode.

③ Sensor Discovery: Unless the sensor discovery is disabled for this sensor type in your console, the console will automatically find and register it once you have inserted the batteries. If you want to change the sequence, you can do this manually by the help of the sensor ID you will find on a sticker on your sensor.

To ensure the best performance of the product, please read this manual carefully and keep it for future reference.

		
Model Number	WH51	WH52
Moisture Range	0~99%	0~99%
Accuracy	±5%	±5%
Soil Temperature	×	-40~60℃ (-40~140℉)
Soil Temperature Accuracy	×	±1℃
EC Value	×	0-10000 μS/cm
EC Accuracy	×	0-1000 μS/cm ± 100 μS/cm; 1-10000 μS/cm ±15%

Moisture Resolution	1%	1%
EC Resolution	×	10 μS/cm
Temperature Resolution	×	0.1℃
IP Rating	IP66 (Main body and sensor)	IP66 (Main body and sensor)
Channels	16	16

Table 1 Comparison between WH51 and WH52

2.Getting Start

2.1 Part List

1 x Soil Moisture, Temperature, and EC Sensor

1 x Short Silicone Cap for LED Indicator

1 x Long Silicone Cap for Battery Compartment

1 x User Manual

Note: Batteries must be purchased separately.

2.2 Overview and Dimensions

2.2.1 Overview

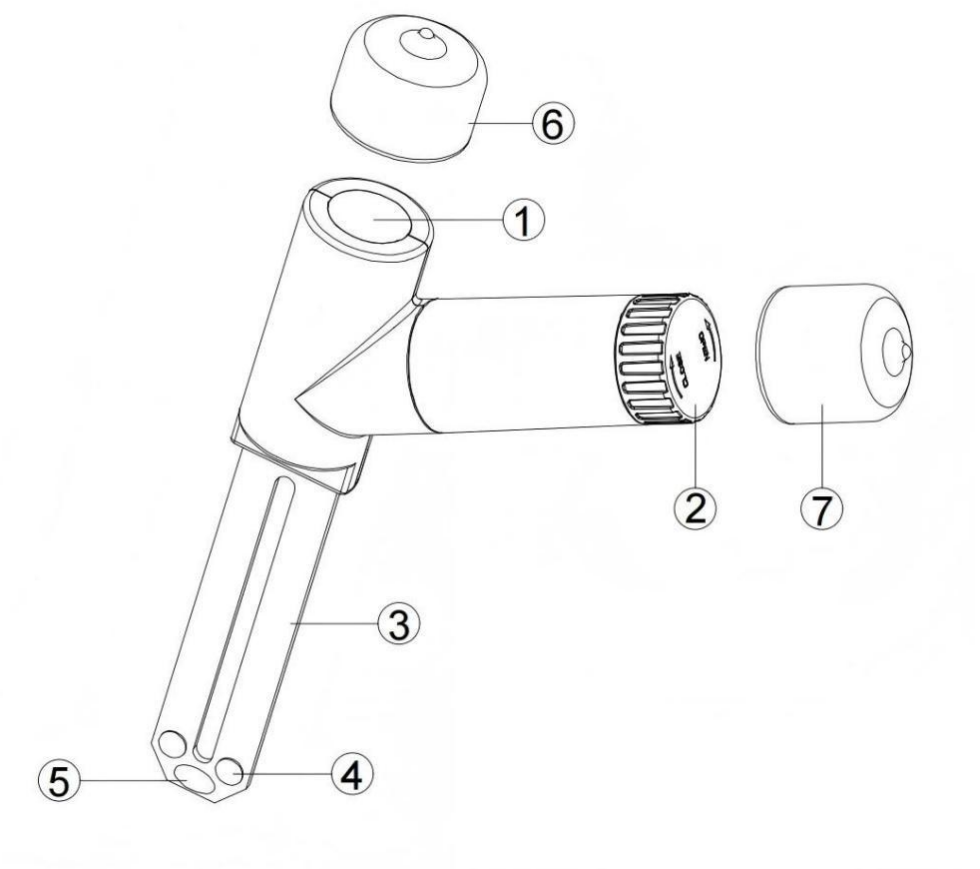


Figure 2 Overview of the Sensor

①	LED Indicator	②	Battery Compartment Cap
③	Soil Moisture Sensor	④	Conductivity (EC) Sensor
⑤	Soil Temperature Sensor	⑥	LED Protection Cap (Light shielding)
⑦	Battery Cap Protection Cover		

Table 2

2.2.2 Sensor Dimensions

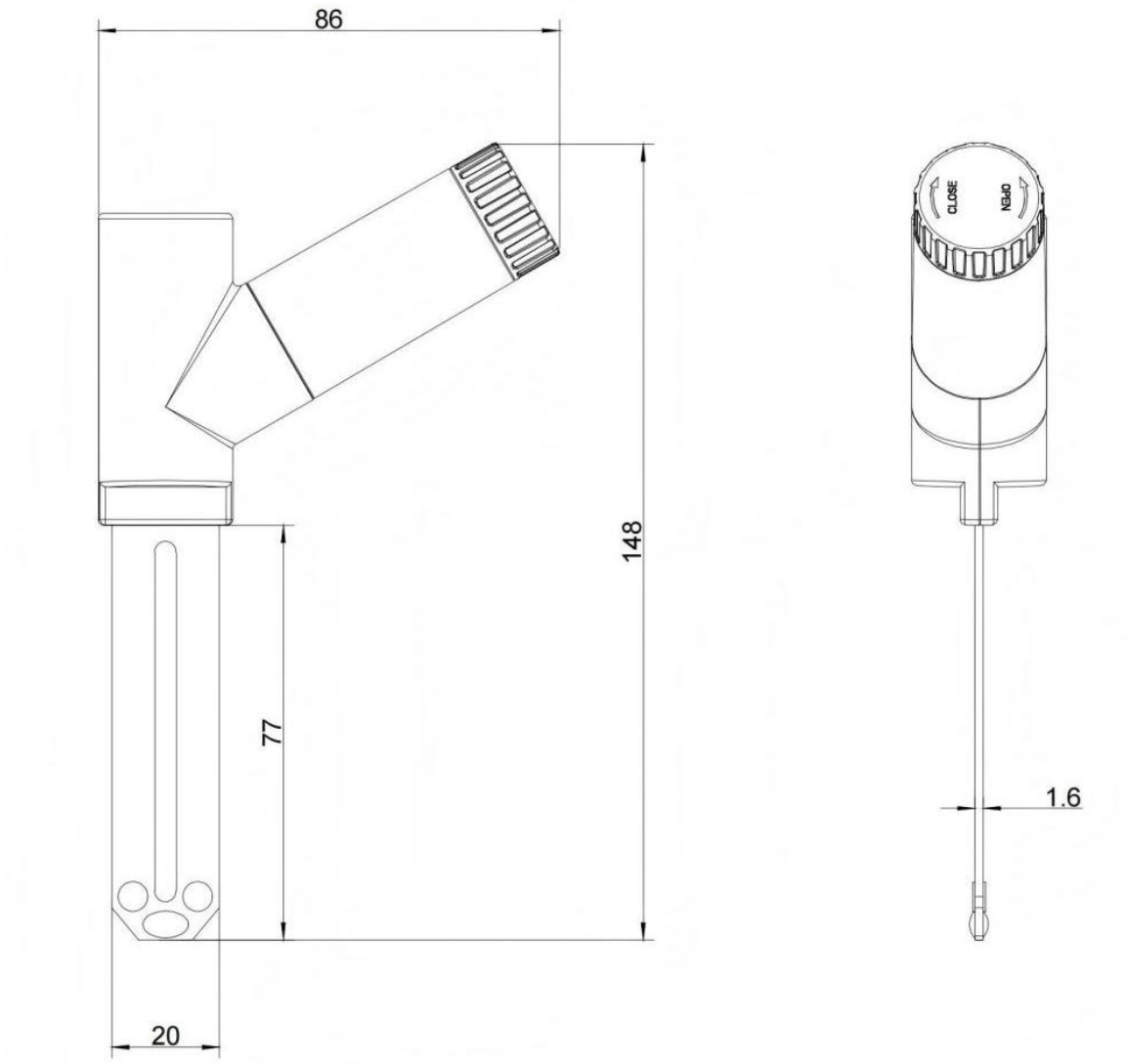


Figure 3 Size of the Sensor

2.3 Installation

Upon receiving the WH52 Soil Moisture, Temperature, and EC sensor, please follow the steps below to install the battery, LED indicator cap, and waterproof battery cover. Then register it with your Wi-Fi Gateway/Console and test the device to ensure it is functioning correctly.

2.3.1 Installing Battery and Silicone Caps

1. Insert one AA battery into the battery compartment as shown in Figure 4.

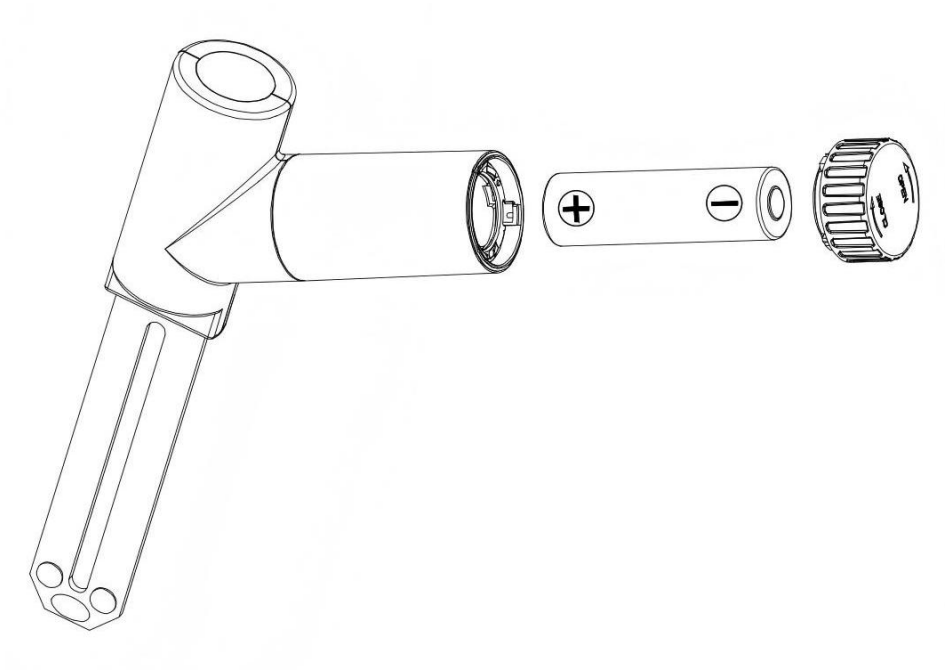


Figure 4

2. Install the long silicone cap over the battery compartment and the short silicone cap over the LED indicator, as shown in Figure 5.

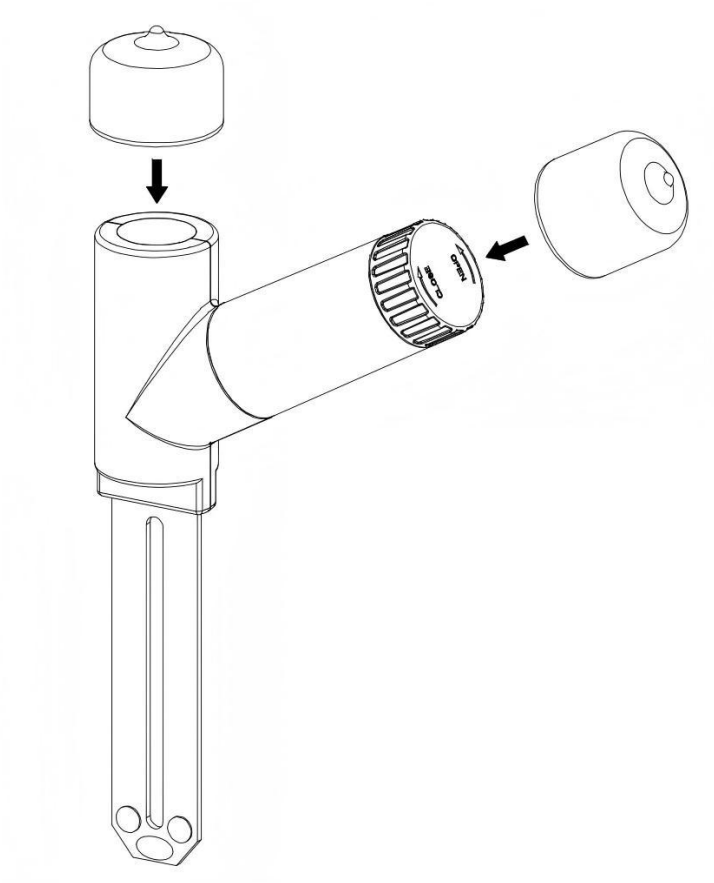


Figure 5

3. **Pre-installation Test:** Before installing the sensor in its permanent location, it is recommended to test it in the air. Confirm that the moisture and EC readings are 0 and the temperature matches the current ambient temperature. Next, place the sensor in a cup of

pure water; the soil moisture reading should rise to 90% or above. Then, add table salt to the water; the EC value should increase. When the sensor detects significant data changes, it will transmit data every 10 seconds. Once you confirm the sensor is operating normally, proceed to the next step.

4. Insert the sensor fully into the target soil location. Do not use excessive force to avoid damaging the sensor.

2.3.2 Wi-Fi Configuration

To view soil moisture, temperature, and EC data on the mobile app and receive email alerts from the weather server, you need to register this device with an Ecowitt Wi-Fi Gateway or

Weather Station Console (sold separately).

2.3.2.1 Pairing with Gateway

If the gateway is running and you have never set up a WH52 sensor before, simply power on the sensor, and the gateway will automatically, register the sensor and pick up the soil moisture, temperature, and EC data.

Note: The gateway supports up to 16 WH51/WH51L/WH52 sensors. Each new sensor will be recognized as a new channel based on the power-on sequence. You can attach channel labels to each sensor for distinction. Channel names can be edited in the app and on ecowitt.net (names do not sync between the two).

(1) See Table 3 for compatible gateway models.

Compatible Gateway:			
Gateway Model	Picture	Upload data	Max number of the channels /devices
GW1100		✔	16 (V2.3.6)
GW2000		✔	16 (V3.1.5)
GW1200		✔	16 (V1.3.3)
GW3000		✔	16 (V1.0.2)

GW3010		✔	16 (V1.0.2)
WS6210 (S)		✔	16

Table 3

(2) Gateway Wi-Fi Connection:

For this section, please refer to the Quick Start Guide and User Manual of your specific gateway.

If you have questions, please contact customer service.

2.3.2.2 Connecting with a Display Console

(1) See Table 4 for a list of compatible display consoles

Compatible consoles:				
Console Model	Picture	Upload data	Display the data	Max number of the channels /devices
HP2550		✔	✔	16 (V2.0.2)
HP2560		✔	✔	16 (V2.0.2)
WN182X		✔	✕	16 (V1.3.4)
WS38X0		✔	✕	16 (V1.3.3)
WS39X0		✔	✕	16 (V1.3.3)
WN1920 /1980		✔	✕	16 (V1.3.4)

Table 4

(2) Console Wi-Fi Connection:

For this section, please refer to the Quick Start Guide and User Manual of your console.

If you have questions, please contact customer service.

2.3.3 Device Testing

After installing the battery and completing the gateway Wi-Fi configuration, fully submerge the WH52 sensor probe in water for about 1 minute. Observe the readings on the Ecowitt App.

If the WH52 readings show significant changes, the sensor is working properly. If not, there may be a fault; please contact our technical support team.

3.Instructions for Use

3.1 WH52 Features

- **Robust IP66 Waterproof Design:** Built to IP66 standards to withstand harsh outdoor environments. Includes silicone protective caps for enhanced water resistance in extreme conditions.
- **Wireless Transmission & Simple LED Indication:** The probe body has no screen; it transmits data via RF signal to a compatible gateway or console for analysis. A simple red LED on the body clearly indicates data transmission status and operational faults.

- **Long Range & Scalable Wireless Range:** Capable of strong wireless transmission up to 100 meters under standard conditions. For complex environments with dense vegetation or physical obstacles, a high-gain antenna can be used at the console end to extend the effective range to 200 meters in open areas.
- **Safe Sensor Installation:** To ensure accurate readings and prevent damage, the sensor must be placed in a pre-dug hole; avoid forcing it into hard, compacted soil. For standard use, the probe should be buried up to the depth marker on the body.

3.2 Function Description

3.2.1 Soil Moisture Sensor

- **Advanced Capacitive Sensing Technology (FDR - Frequency Domain Reflectometry):** Measures moisture based on the principle of soil dielectric constant. Readings are highest in water and lowest in air. This method ensures readings are highly correlated with actual soil water content.
- **Calibration Mode:** For research and industrial applications requiring high precision, manual calibration is recommended. For general user cases, the App's trend graph eliminates the need

for complex calibration—simply monitor the moisture trend, record your watering habits, and establish personalized dry/wet thresholds for optimal plant care.

3.2.2 Soil Temperature Sensor

- **Precision Thermistor**

  Technology: Uses a high-precision NTC thermistor to directly measure the thermal state of the soil medium. The probe makes close contact with soil particles to ensure it measures the temperature actually perceived by the roots, not the air temperature. This

ensures stable, fast-response readings highly correlated with root physiology.

- **Soil Thermal Considerations:** Soil temperature changes slowly but has profound effects. Under standard installation, it accurately reflects the root zone thermal environment. In mulch, high organic matter, or extreme dry/wet conditions, the sensor provides the precise physical temperature at the installation point; users should interpret ecological significance based on soil type and environment.

3.2.3 Soil EC (Electrical Conductivity) Sensor

- **Dual-Electrode Conductivity Measurement:** Measures the total concentration of soluble salt ions in the soil solution by measuring conductivity between electrodes inserted into the soil. Results are expressed in micro-Siemens per centimeter (μS/cm).

- **Quantified Scale for Fertilizer Management:** EC is a key indicator of **Soil Salinity** and **Nutrient Concentration**, directly affecting plant growth. It transforms fertilization from guesswork into quantified management. General users can observe

"pulse" rises and falls in EC before and after fertilization to judge if fertilizer is being effectively utilized. The App allows setting safety thresholds to prevent "fertilizer burn." Professional growers can use it with irrigation systems to monitor precision fertigation strategies.

- **Data Interpretation: EC values MUST be interpreted in synchronization with Soil Moisture data.** EC reflects salt concentration in the soil solution, which changes dynamically with water content:

  ① After Watering: EC usually drops temporarily due to dilution.

② During Drying: As water evaporates, salts concentrate, and EC gradually rises.

③ Correct Logic: Focus on the stable EC value after watering but before plant absorption (i.e., when soil moisture is near field capacity) as the basis for judging fertilizer concentration.

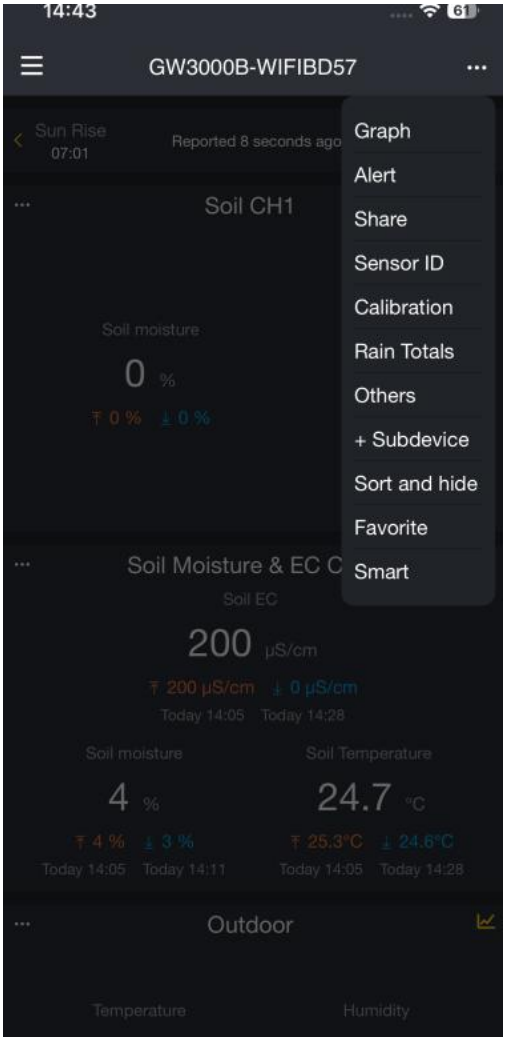
- **Calibration:** Factory calibrated with standard solutions to meet general agricultural and horticultural needs.

- **Maintenance:** To ensure good electrode contact and representative readings, wet the soil to a moderate humidity (not muddy) before installation. Over time, salt crystals or

dirt may adhere to electrodes; **periodic inspection and gentle cleaning (e.g., quarterly) is recommended.** Avoid concentrating high-strength fertilizer near the sensor.

3.3 Calibration Modes

After completing Wi-Fi configuration of your console and logging into the Ecowitt app, you can calibrate the soil moisture sensor using Custom Mode. (Tap "Weather Station" → Select the console/gateway → Tap "..." in the top right → Select Calibration → Select "Multi_CH Soil" to manually calibrate).



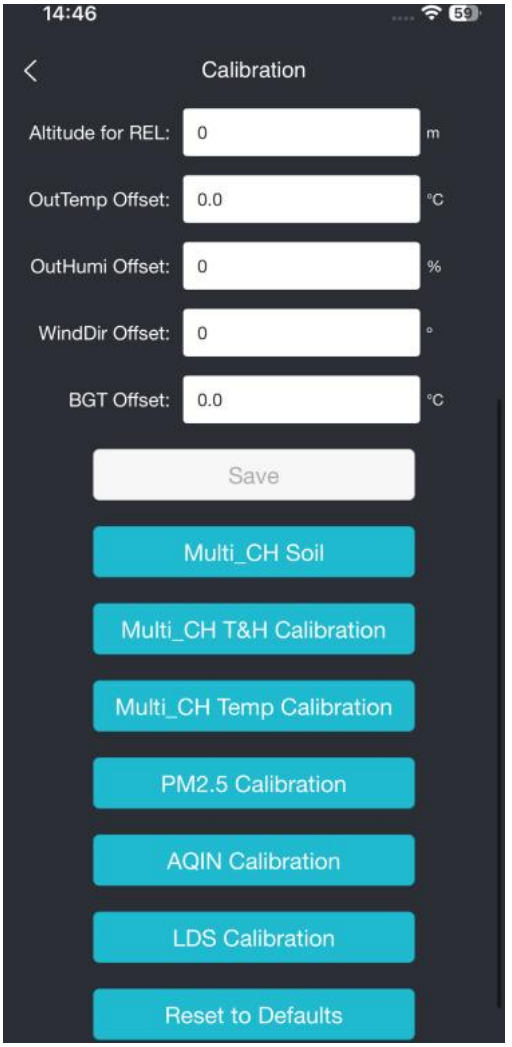


Figure 6

Figure 7

Figure 8

3.3.1 EC Calibration:

An EC GAIN parameter is available for setting. For example, if the EC reading is 100 μ S/cm

and you set the GAIN to 1.1, the reading will be adjusted to 110 μS/cm. The GAIN setting range is 0.5 - 1.5.

3.3.2 Soil moisture Calibration:

3.3.2.1 Custom Off (Default):

Moisture values are calculated based on default dry/wet definitions:

- Dry (0% AD): 70
- Wet (100% AD): 500

Soil Moisture = (moisture AD – 0%AD) * 100% / (100% AD – 0%AD)

Example: when sensor moisture AD is 310, calculated moisture is:

(310 – 70)*100% / (500-70) = 56%.

This is a fixed slope rate linear system.

3.3.2.2 Custom ON:

When pot soil at dry or wet condition is not giving the moisture sensor output value that is close to its default assumption, it will give inaccurate moisture level results. It is commonly happening with different soil type that gives very different output value at same moisture level condition. We introduced this custom mode to make this slope flexible so that it can match your soil type.

This becomes a variable slope rate linear system.

Adjusting principle:

- **0%AD** is used to adjust for dry condition reading inconsistency. When the displayed moisture readings are too high at dry soil condition, you could lower the slope rate by increasing the 0%AD value.
- **100%AD** is used to adapt for wet condition reading inconsistency. When the displayed moisture readings are too low at extremely wet soil condition, you could decrease the 100%AD value to fix it.

Please refer to the below example for better understanding.

Scenario 1:

When first using the product (Custom Mode

recommended OFF initially):

You place the sensor in a glass of fresh water, and the displayed moisture reading is far below 95% (e.g., 70%).

- Solution: Enable Custom Mode and adjust the 100% AD value.
- Formula: Soil Moisture = (Current AD - 0%AD) * 100% / (100%AD - 0%AD)
- Calculation:

  ① Current AD = 183

  ② Default 0% AD = 70

  ③ Target Reading = 95%

  ④ 95% = (183 - 70) * 100% / (Target

100%AD - 70)

⑤ Result: 100% AD = 188 (Integer).

- **Adjust the default 100% AD to 188. Tap the screen once to update. When the expected reading is achieved, tap "Save".**

Scenario 2:

You place the sensor in a dry environment (air, no water contact), and the displayed reading is far above 0% (e.g., 40%).

- **Solution: Enable Custom Mode and adjust the 0% AD value.**
- **Formula: Soil Moisture = (Current AD - 0%AD) * 100% / (500 - 0%AD)**

- **Calculation:**

  ① Current AD = 183

  ② Default 100% AD = 500

  ③ Target Reading = 10% (Note: In air, target should ideally be 0%, but the example uses 10% for calculation demonstration).

  ④ 10% = (183 - Target 0%AD) * 100% / (500 - Target 0%AD)

  ⑤ Result: 0% AD = 147 (Integer).

- **Adjust the default 0% AD to 147. Tap the screen once to update. When the expected reading is achieved, tap "Save".**

■ **Note:** The soil moisture sensor should be

inserted totally into the soil for accurate result.

- Record the 0%AD and 100%AD value for future use(as a security measure in case configuration data get lost().
- **Note:** In general, the sensor need to be calibrated to suit your soil type.
- **Note:** Calibration is only saved on the console/gateway side; so, if you have two different consoles handling this data, you will need to enable custom mode and having same calibration for 0% and 100% to make both consoles showing the same soil moisture values.

4.Real-time Data and Compatibility

4.1 When connected with a Gateway

- Monitor live sensor data on the Live Data page of the WS View Plus app and Ecowitt app (requires that the gateway and your smartphone are using the same local (Wi-Fi) network)
- Up to 16 channels are supported when updated to the corresponding firmware. Channel names can be edited on the Ecowitt app or at ecowitt.net.

4.2 When paired with a Weather Station Console

4.2.1 HP2550/HP2560

- Supports up to 16 channels when firmware is updated to V2.0.2.
- View real-time soil moisture data on the console display.
- No soil temperature and EC shown on the screen.

4.2.2 WN182X Display Console

- Supports up to 16 channels when firmware is upgraded to V1.3.4.
- View real-time soil moisture data via the Ecowitt app.

- No soil temperature and EC shown on the screen.

4.2.3 WS38X0/WS39X0 Display Console

- Supports up to 16 channels when firmware is updated to V1.3.3.
- Real-time data cannot be viewed on the display screen.
- Only supports connecting to a WH52 and uploading data to the internet.

4.2.4 WN1920/WN1980 Display Console

- Supports up to 16 channels when firmware is upgraded to V1.3.4.
- Real-time data cannot be viewed on the display screen.

- Only supports connecting to a WH52 and uploading data to the internet.

Note: If the sensor cannot be connected, it may be due to an outdated console firmware version. Please update your console to the latest firmware. If it still doesn't show, please contact us and check for the latest firmware release.

4.3 When uploaded to Ecowitt Weather Server

- View current soil moisture data & history records & graph on the website
- Set and receive email alerts from the server
- Channel names can be edited on the website

- Remote monitoring with smart phone, laptop, or computer by visiting the website

Note: WH51(L) and WH52 sensors will be recognized by the app software as the same sensor type. If both models are purchased, they will share the 16 available channels; the total number of channels for both sensors cannot exceed 16.

5. Specifications

Model	WH52
Name	3-in-1 Soil Sensor
Dimensions	148 x 86 x 25mm
Material of Housing	ABS

Material of Probe	FR-4(Glass Fiber Reinforced Epoxy)
Measurement Principle	Frequency Domain Reflectometry
Moisture Range	0~100%
Moisture Accuracy	±5%
Moisture Resolution	1%
Soil Temperature Range	-40 ~ 60°C (-40 ~ 140°F)
Soil Temperature Accuracy	±1°C
EC Range	0 - 10000 μS/cm
EC Accuracy	0-1000μS/cm ±100μS/cm; 1-10000μS/cm ±15%
Update Interval	Approx. 1 minute

Device Operating Range	-40~60℃ (Values below 0℃ for moisture and EC are not reliable for reference)
IP Rating	IP66
0%AD setting range	0~200; Initial value: default to factory calibration
100%AD setting range	0%AD+10~1000; Initial value: default to its factory calibration
RF Frequency	915/868/433MHz depending on location (North American:915MHz; Europe:868MHz; Other areas:433MHz)
Sensor reporting interval	70 seconds

Transmission distance in open field	100m(328 feet)
IP Rating	IP66
Power Supply	1xAA battery (not included)
Battery life	Minimum 12 months

table5

6.Care + Maintenance

When batteries of different brand or type are used together, or new and old batteries are used together, some batteries may be over-discharged due to a difference of voltage or capacity. This can result in venting, leakage, and rupture and may cause personal injury.

• Do not mix Alkaline, Lithium, standard, or rechargeable batteries.
• Always purchase the correct size and grade of battery most suitable for the intended use.
• Always replace the whole set of batteries at one time, taking care not to mix old and new ones, or batteries of different types.
• Clean the battery contacts and also those of the device prior to battery installation.
• Ensure the batteries are installed correctly with regard to polarity (+ and -).
• Remove batteries from product during periods of non-use. Battery leakage can cause corrosion and damage to this product.
• Remove used batteries promptly.
• For recycling and disposal of batteries, and to

protect the environment, please check the internet or your local phone directory for local recycling centers and/or follow local government regulations.

7.Warranty & Caution

7.1 Warranty

We disclaim responsibility for any technical error,
printing error, or the consequences thereof.
All trademarks and patents are recognized.
We provide a 2-year limited warranty on this product against manufacturing defects or defects in materials and workmanship.

This limited warranty begins on the original date of purchase, is valid only on products purchased, and is only to the original purchaser. The purchaser must contact us for problem determination and service procedures to receive warranty service.

This limited warranty covers only actual defects within the product itself. It does not cover the cost of installation or removal from a fixed installation, standard set-up, or adjustments, claims based on seller misrepresentation, or performance variations resulting from installation-related circumstances.

7.2 FCC

This device complies with part 15 of the FCC

Rules. Operation is subject to the following conditions: (1) this device should not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This

equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception,which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-- Reorient or relocate the receiving antenna.

-- Increase the separation between the equipment and receiver.

-- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.

-- Consult the dealer or an experienced radio/TV technician for help.

To maintain compliance with RF Exposure guidelines, This equipment should be installed and operated with a minimum distance between 20cm of the radiator and your body. Use only the supplied antenna.

IC Caution:

English:

This device contains license-exempt transmitter(s)/receiver(s) that comply with Innovation, Science, and Economic Development Canada's license-exempt RSS(s). Operation is subject to the following two

Conditions:

1. This device may not cause interference.

2. This device must accept any interference, including interference that may cause the

undesired operation.

French:

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

1. L'appareil ne doit pas produire de brouillage;

2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Manufacture: Shenzhen Fine Offset Electronics Co., Ltd.

Address: 4/F, Block C, JiuJiu Industrial City, Shajing To wn, Baoan District, Shenzhen City, China

8. Contact Us

8.1 After-sales Service

Order Issues:

If you encounter any missing or incorrect shipments of Ecowitt products purchased, please reach out to the respective platform's customer service from the store where you bought the

product for assistance.

Usage Inquiries:

Our product is continuously changing and improving, particularly online services and associated applications. To download the latest manual, and additional help, and for any issues related to product usage feel free to contact our customer support team at support@ecowitt.com. We are committed to providing assistance and resolving any concerns you may have.

8.2 Stay in Touch

Ask questions, watch setup videos, and provide feedback on our social media outlets. Follow Ecowitt on Discord, YouTube, Facebook and Twitter.